

A Q U A P H Y T E

Center for Aquatic Plants

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AQUATIC PLANT MANAGEMENT: FUTURE CONCERNS

by Tom C. Brown, former Chief, Bureau of Aquatic Plant Management,
Florida Department of Environmental Protection.

(Note: Brown resigned as Bureau Chief during a tussel with legislators this past spring. The following are excerpts from his last speech presented as Chief to an aquatic plant management audience.)

At the Bureau of Aquatic Plant Management, we readily admit our weaknesses, but at the same time we are proud to be a part of the aquatic plant management profession in Florida. I consider Florida's professionals and programs to be the best in the world.

We all have tremendous challenges before us as we face the profound environmental and economic problems being created by invasive nonindigenous plants in Florida. In light of the crisis, there are at least three major concerns for the future that stand out.

The first concern we have is that the public, along with many of the political leaders of our state, have not shown any great concern over the crisis being created by invasive exotic aquatic plants. For whatever reasons, they are in a state of denial. When the evidence is clear and intelligent people will not accept that evidence, then they are in psychological denial, and as long as that denial lasts the aquatic ecosystems of this state will continue to suffer.

Perhaps one reason for the lack of general interest in the problem is the conservation dilemma posed by invasive exotic aquatic species. I am referring to the fact that the actions required to "correct" the problems entail the killing or removal of these plants. Such activities are far less popular than traditional activities related to environmental protection such as buying land for preservation, mitigation that attempts to create wetlands, or regulatory activities that are designed to protect threatened and endangered species. While the public and our leaders profess to support the idea of preserving and restoring aquatic ecosystems, killing nonindigenous plants in order to accomplish this is not appealing to them. This negative attitude often causes resistance, not only to the effective methods available (most of which are the result of outstanding research), but to the idea that such management is a necessity at all. We often hear someone contend that when a monospecific stand of invasive exotics is found in a water body, we should just leave it alone and let "nature" take care of the problem. They forget that "nature" did not place these plants here, and their co-evolved natural enemies which keep them in balance in their home range are not present.

Others contend that nothing serious has really happened, that we just have to change the use we make of that water body. But what use can we make of a lake covered entirely with topped-out hydrilla? We can't swim in it. We can't fish it. Recreational boating is impossible. Even flood control and irrigation are adversely affected. In addition, the native biodiversity is being displaced, and property values are being lowered. Probably the only ones happy with this situation are the few ducks and coots that feed on hydrilla--a big price to pay for duck food!

[See Future on Page 6]

Remember the Reprints!

The Aquatic and Wetland Plant Information Retrieval System (APIRS) continues to rely on contributions by authors of their published work. These contributions can include reprints, agency reports, proceedings of meetings, books, CD-ROMs, and other published materials. Author contributed material helps us to maintain the most comprehensive collection of literature in the world on any subject relating to aquatic and wetland plants. Therefore, if you have a mailing list for reprints of your work, please include APIRS. In exchange, we still provide free literature searches of the APIRS database, or you may perform your own literature searches online via our website at <http://aquat1.ifas.ufl.edu/>

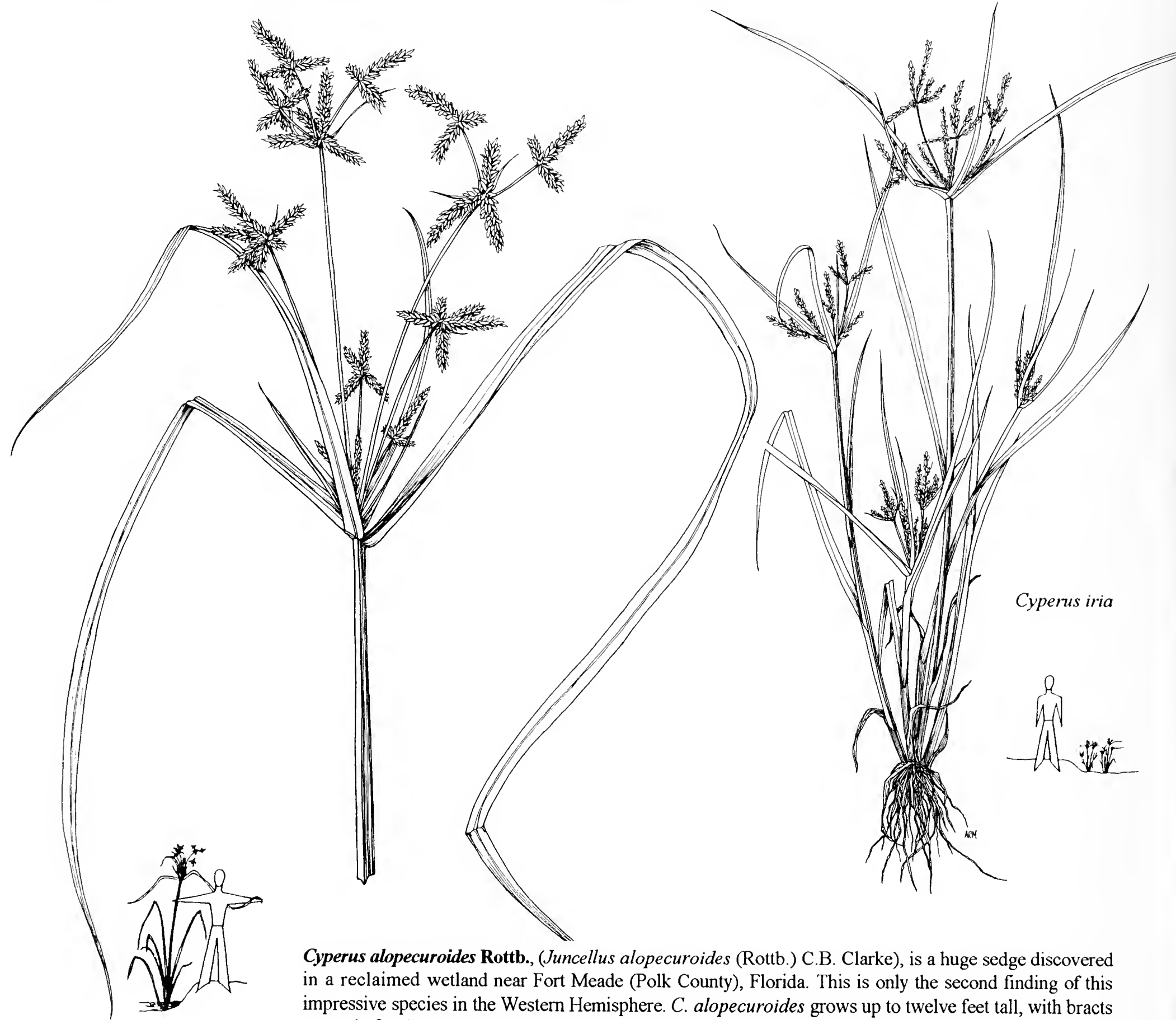
To those who have consistently sent us their reprints and other materials over the years, *thank you* for supporting APIRS, your fellow researchers, students, agency managers, field personnel, and others around the world!

We skipped a beat...

Though the beat has gone on for 32 consecutive issues, we skipped one last spring when AQUAPHYTE was not published as usual. Reduced staffing and funding, and more pressing matters, made it impossible. So, when thumbing through your past issues, remember that Volume 17 has only 1 number, and this is it, Winter 1997.

Cyperus Weeds ALERT

Here are four more exotic aquatic *Cyperus* weed species which now occur in Florida, and aquatic plant managers should "be on the lookout" for them. Two of these sedges are listed by Holm (1977) as being among the world's worst weeds (along with water hyacinth, hydrilla and others). Dr. Charles T. Bryson, an expert on the Cyperaceae, recently contributed photographs and plant material of these species to APIRS. Bryson is with the United States Department of Agriculture, Agricultural Research Service (USDA-ARS), Southern Weed Science Research Unit, Stoneville, Mississippi 38776-0350, 601-686-5259. E-mail: cbryson@ag.gov



Cyperus alopecuroides

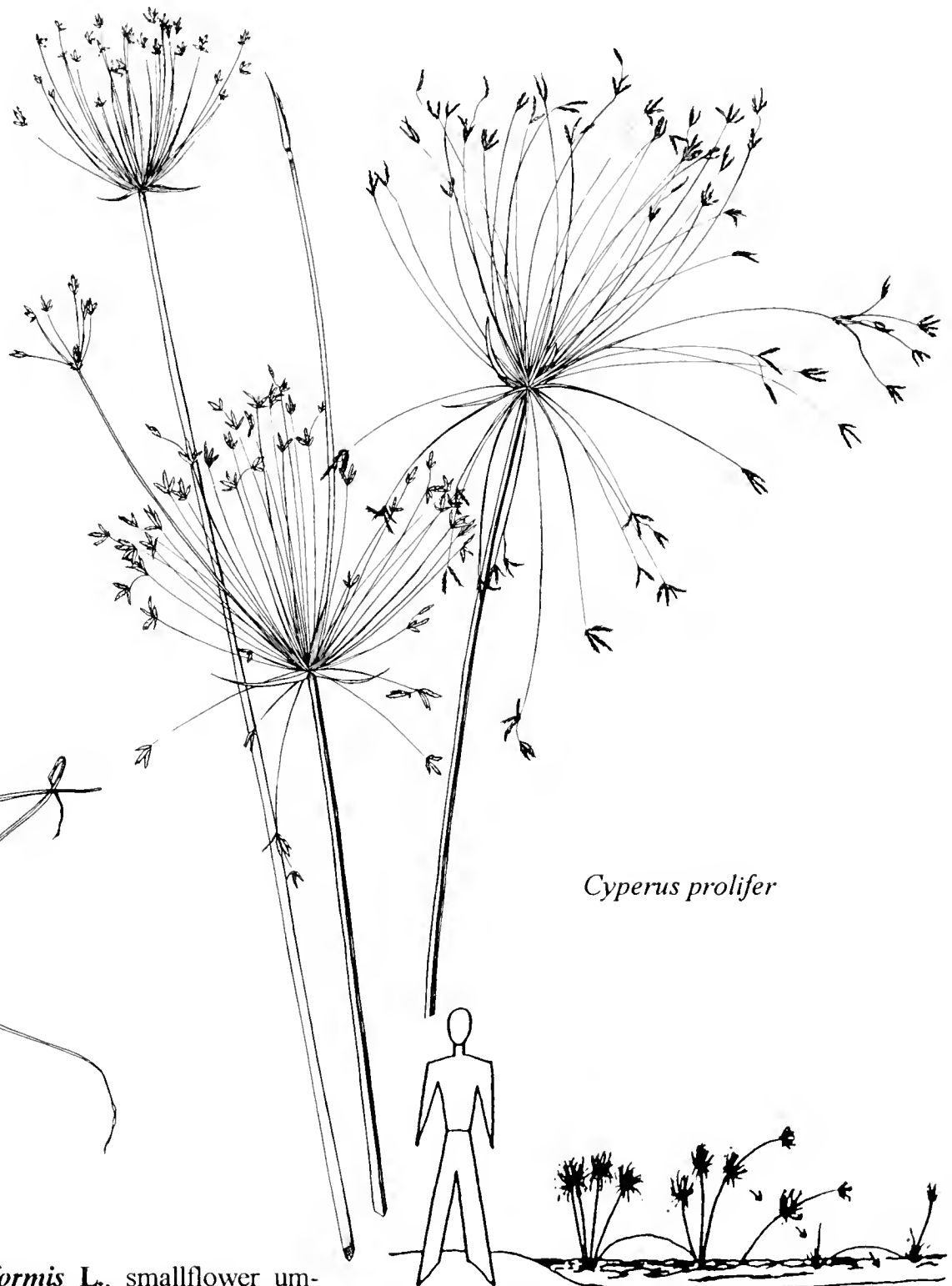
Cyperus alopecuroides Rottb., (*Juncellus alopecuroides* (Rottb.) C.B. Clarke), is a huge sedge discovered in a reclaimed wetland near Fort Meade (Polk County), Florida. This is only the second finding of this impressive species in the Western Hemisphere. *C. alopecuroides* grows up to twelve feet tall, with bracts up to six feet long! It has broad bracts and leaf blades and a branched inflorescence with spikes of densely clustered golden-brown spikelets. Its leaf margins are serrated and sharp. This species is widely distributed in the tropics of the Old World where it may form extensive stands and floating mats. According to Bryson, of the four species discussed here, this one likely would become the most troublesome weed in Florida conditions.

Cyperus iria

illustrations by Ann Murray,
Center for Aquatic Plants, 1997



Cyperus iria L., rice flatsedge, is in Holm's list of the world's worst weeds. An Asiatic species, it was probably introduced in the 1700 or 1800s. Rice flatsedge has become common throughout the southeastern United States. Once established in wet situations, rice flatsedge can persist without wet feet, and become a major weed in rice, cotton, soybean and other crops.

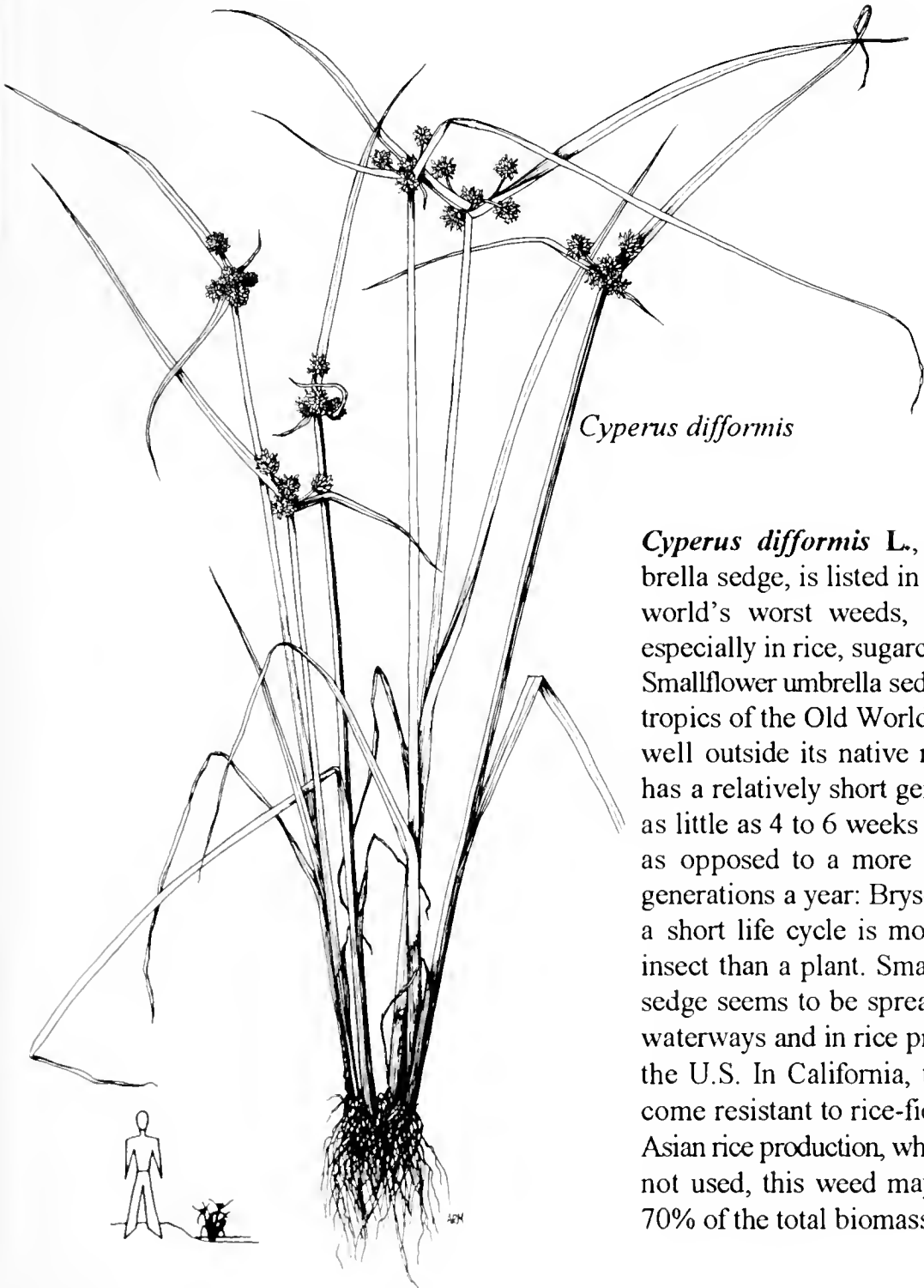


Cyperus prolifer

Cyperus prolifer Lam., dwarf papyrus or miniature papyrus, is commonly sold as an ornamental for use in water gardens, similar to papyrus (*Cyperus papyrus* L.), and false papyrus (*Cyperus involucratus* Poir.). This species spreads vegetatively, simply by leaning over. New daughter plants grow *in the inflorescence*; as the new shoots become heavier, the mother plant leans over, eventually reaching the mud whereupon the daughter plants attach, grow and spread. In central Florida, this sedge apparently has escaped from cultivation and is found growing in floating mats and along margins of limesink lakes.

Cyperus difformis

Cyperus difformis L., smallflower umbrella sedge, is listed in Holm's list of the world's worst weeds, being a problem especially in rice, sugarcane, tea and corn. Smallflower umbrella sedge is native to the tropics of the Old World, but is spreading well outside its native range. This sedge has a relatively short generation period of as little as 4 to 6 weeks from seed to seed as opposed to a more usual one or two generations a year: Bryson notes that such a short life cycle is more like that of an insect than a plant. Smallflower umbrella sedge seems to be spreading along major waterways and in rice production areas of the U.S. In California, this plant has become resistant to rice-field herbicides. In Asian rice production, where herbicides are not used, this weed may account for 60-70% of the total biomass of the rice field.



Will the Rare Aquatic Carnivorous Plant *Aldrovanda vesiculosa* Survive in Europe?

by Lubomír Adamec, Institute of Botany of the Academy of Sciences of the Czech Republic, Section of Plant Ecology, Dukelská 145, CZ-379 82 Třeboň, Czech Republic, adamec@butbn.cas.cz

The waterwheel plant, *Aldrovanda vesiculosa* L. (*Droseraceae*), is a very rare aquatic carnivorous plant that is rapidly vanishing from Europe. Yet it is spread over a vast territory throughout the Old World. It is a rootless plant, usually 6-18 cm long, free-floating just below the water surface. It has always excited curiosity among botanists due to its attractive snapping traps (3-6 mm long). *Aldrovanda* has the same life form and growth strategy as temperate aquatic *Utricularia* species: a fast apical growth (1-2 whorls a day) and simultaneous basal decay. In temperate countries, it propagates only by apical branching of shoots. Apical winter buds (turions) are formed in autumn.

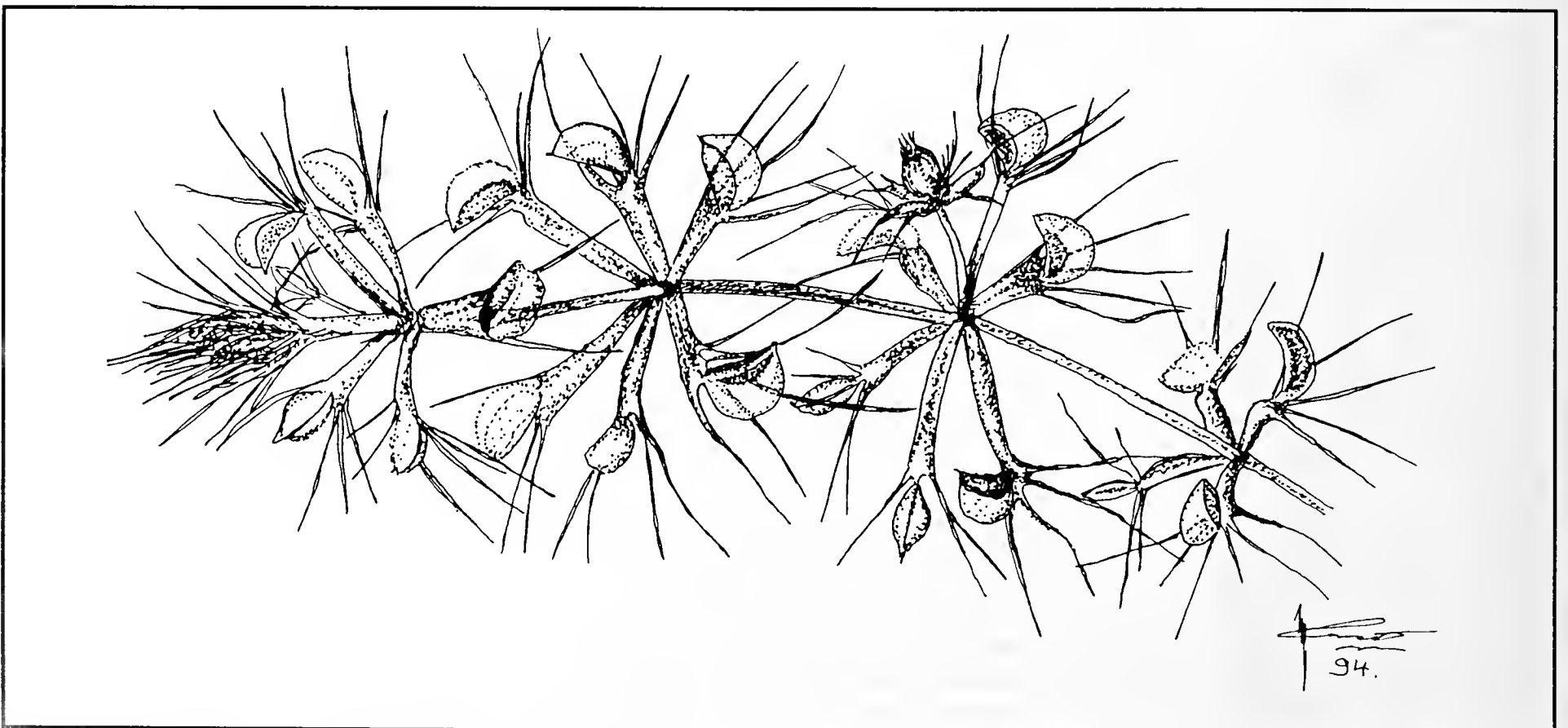
Distribution

Aldrovanda is spread irregularly and sparsely from temperate to tropical zones from Europe to Australia. The origin of its recent population in Europe is still unclear. Here, on the basis of palaeontological records, it is usually considered a Tertiary relict. Since its turions probably are spread by migratory waterfowl to new sites, another theory explains the origin of its European temperate populations as postglacial naturalization of African plants that were transported by birds. In any case, the historical postglacial spread of *Aldrovanda* in Europe was highly irregular, variable in time and area, and probably dependent on migratory routes of waterfowl. Recent data on its distribution in Africa and Asia are not available (except for Japan) and only a few recent sites are known from Australia. In Europe, it occurred more frequently and was recorded at about 150 sites in the last two centuries. However,

the view on the recent map of its sites is alarming. It has declined dramatically in the last 30 years, vanishing from Germany, France, Italy, and Slovakia. It is now probable that Europe (excluding the former USSR) has no more than 15-20 sites, with a few dozen sites in the Ukraine and Russia. There are ten sites still in Poland (from a previous record of 78), one in Hungary, and possibly, a very few in the Balkans. Two artificial sites are in Switzerland where it was successfully introduced in 1908. In all European countries, it has had a status of "critically endangered species" and has been under strict state protection for at least twenty years. Yet, this has not helped much!

Ecological Requirements and Reasons for Decline

Aldrovanda is highly sensitive to competition with filamentous algae and higher aquatic plants that form denser stands. Very fast apical growth and vegetative propagation are the only way to overcome the competition. The most important ecological requirements of *Aldrovanda* include: a) free-CO₂ concentration >0.1 mM as the plant is a strict CO₂ user; pH may be within 5.0-7.6; b) a medium humic acid concentration (2-30 mg.l⁻¹); c) high biomass of plant litter from reeds or sedges; d) water surface free of a dense biomass of submersed or floating macrophytes; e) transparent water free of suspended matter or phytoplankton; f) relative irradiance >20 % of full sun; g) relatively warm water in summer (optimum 25-28°C); h) shallow water (0.15-0.6 m, but summer minimum 5-10 cm); i) abundant zooplankton as prey; j) oligo-mesotrophic water.



Aldrovanda vesiculosa L. by I. Pencak (used with permission)

Aldrovanda grows in shallow standing dystrophic waters: lakes, bogs, fens, backwater pools, and peaty fishponds, usually on very limited plots in wind-exposed littorals. It never grows in open water, but only in shallow, loose stands of emergent vegetation (*Phragmites*, *Typha*, *Carex*) or in little bays among tussocks of denser vegetation. The strict habitat requirements of *Aldrovanda* characterize it as a stenotopic species. Its preferred sites are those subject to slow, permanent succession wherein the emergent vegetation becomes dense. Generally, small habitat changes may result in the decline of *Aldrovanda*. That is why its occurrence at a site usually is limited in time and it may be found at other proximate site(s) where favourable conditions have developed (a "fugitive strategy"). In the last decades, however, the number of potential suitable sites has decreased drastically in many European countries and its chance to "jump" to new sites has greatly diminished. Its rapid decline has been caused mainly by water eutrophication, drainage, and filling in of water bodies. Other reasons may be more general land-use changes, particularly intensive agriculture, water level fluctuations, and wetland afforestation. Besides the evident reasons, high amounts of NO_3^- , NH_4^+ , and SO_4^{2-} in acid precipitates might accelerate eutrophication and, hence, native succession of shallow wetlands. This is suspected because *Aldrovanda* has been vanishing even from those sites which are evidently quite unimpacted by man. Also, the velocity of its decline has been much higher within the last 30 years than before.

Active Protection - Selection of New Sites

Elaboration of reliable outdoor culture of *Aldrovanda* was a necessary prerequisite for both ecophysiological study and selection of its suitable substitute sites in the Czech Republic. The culture mimics habitat conditions at natural sites. In a 1-2.5 m² plastic container, about a 3 cm layer of litter of *Carex gracilis* (or similar species), placed over 5-8 cm of sand, is used as the bottom substrate. The container is loosely planted with sedges or common reed. Water depth is 20-30 cm. As *Aldrovanda* is susceptible to boron deficiency, boric acid must be added. Turions overwinter well in the refrigerator.

Great effort has been made to select new suitable sites in the Czech Republic. The plants placed in nylon enclosures in three shallow dystrophic wetlands in North and South Bohemia grew rapidly and reproduced 8-34 times over the 1994 season. Approximately 10-50% of the turions overwintered. When 30 *Aldrovanda* plants were introduced to the suitable sites in South Bohemia in 1995, the plants grew rapidly only in the *Carex rostrata*-dominated pool at Ptačí blato 1C. However, turions overwintered perfectly and in the 1996-1997 seasons, the plants propagated richly, forming an abundant population. The character of the suitable pools at Ptačí blato reminds us of some natural Polish sites. Water level at the sites in summer has been found to be the crucial factor for rapid growth and propagation of *Aldrovanda*. Both of the dystrophic sites are firmly connected with hypereutrophic fishponds with fluctuating water levels due to summer rains. The water level was very low in 1995, but high in 1996 and 1997.

Thus, a new prolific site arose in South Bohemia, where *Aldrovanda* had never grown. However, this success should be accepted cautiously as the suitable pools tend towards eutrophication and overgrowing and some management will be necessary in future

years to keep up its rich population. Similar introduction of *Aldrovanda* succeeded in Switzerland as early as 1908 and a stable population has been growing there since. Nowadays, when its natural spread by waterfowl within vast areas of Europe is almost excluded and its natural populations are declining, introduction to new sites is probably the only effective way to keep and propagate the European population, in spite of some success with growing it in tissue culture.

To increase the feasibility of introductions of *Aldrovanda* to new sites, it is essential to grow it in outdoor culture, e.g. in botanical gardens or research institutes (so far Třeboň, Wrocław, Berlin, Kiel, Arras, and Strasbourg) and select potential sites. It also might be a project for Nature Conservation Unions. These organizations in European countries are challenged to consider their participation in the conservation of *Aldrovanda*. I am able to provide them with sufficient plant material for cultivation as well as know-how. *Aldrovanda* is still waiting ...!

Note: The author asks colleagues working in Africa to please send living plants or seeds of *Aldrovanda* to the above address. The study of African plants could provide more clues to the origin of European populations. Any information on recent African spread of *Aldrovanda* is greatly welcome.

	1995		1996		1997
	12-13	18	29-30	9-10	7-21
	JUN	SEP	MAY	SEP	SEP
SITE:	AP	TUR	AP	TUR	TUR
Ptačí blato 1C	48	480	176	2669	≈4000
Ptačí blato 1T	42	52	142	841	≈2000
Ptačí blato 2	42	36	65	908	≈1000
Ptačí blato 9	39	52	27	984	≈4000
Domanínský	32	67	79	142	≈300

Summary of free introduction of *A. vesiculosa* (June 1995, 30 plants) to dystrophic pools in Třeboň region, South Bohemia, Czech Republic. Total number of apices (AP) or turions (TUR) are shown.

References:

- Adamec L., 1995. Ecological requirements and recent European distribution of the aquatic carnivorous plant *Aldrovanda vesiculosa* L. - a review. *Folia Geobot. Phytotax.* 30: 53-61.
- Adamec L., 1997. Photosynthetic characteristics of the aquatic carnivorous plant *Aldrovanda vesiculosa*. *Aquat. Bot.* (in press).
- Kaminski R., 1987. Studies on the ecology of *Aldrovanda vesiculosa* L. I. Ecological differentiation of *A. vesiculosa* population under the influence of chemical factors in the habitat. *Ekol. Pol.* 35: 559-590.
- Carniv. Plant Newslett.* (1997) 26: (special September issue on *Aldrovanda*).

[Future, from page 1]

This sometimes agonizingly slow, and sometimes startling rapid attack on biodiversity has come to be considered "normal", and is therefore largely ignored. Most of the state and its waters are no longer in a pristine or undisturbed condition. Native species are increasingly confined to limited spaces, habitat islands with artificial boundaries and conditions. These spaces were originally influenced by natural processes originating both within and outside their boundaries. These natural processes have been extensively altered by human activities. During the coming decades, the populations of invasive exotic species that do well in these disturbed environments will continue to thrive unless corrective actions are taken.

A second concern for the future relates to the continued introduction of new invasive nonindigenous species. Will there be another hydrilla-like exotic to appear in our water bodies in the future? With the continued importation, sale, and dissemination of nonindigenous aquatic plants without their first being screened for potential invasiveness, it is not a question of "if" but "when". It is shocking to see the cavalier attitude with which nonindigenous species are allowed to be imported into our state. We recognize that most exotics will never become invasive if they escape into the natural environment, and we also recognize that some exotics enhance our lives in many ways, not only as food, but also as things that provide aesthetic values. However that should not keep us from being concerned about those that do escape and do become invasive. New invasive exotics could literally cost millions, if not hundreds of millions to eradicate or keep under maintenance control, and frankly, we do not have the necessary funds to deal with those we already have.

What value do we place upon our ecosystems? What value do we place upon native habitat for fish and wildlife? What value do we place upon the loss of the use of our water bodies for recreational purposes? What value do we place upon irrigation, or flood control, or even our potable water supply? True, all of these things are difficult to evaluate, but that does not mean they have no economic value. It is hard to off-set all these costs with the little profit that is to be had by a special interest group through the sale of invasive nonindigenous aquatic plant species.

During the past twenty years, millions of dollars have been spent in the programs to bring invasive exotic aquatic plants under maintenance control, while at the same time virtually nothing has

been spent to prohibit the introduction of additional invasive exotic plant species. That is the moral equivalent of trying to clean up a water body while you continue to dump untreated sewage into it. Under present law, there is nothing that can be done until after an exotic introduction has occurred and proved to be invasive. By that time, eradication may be impossible and the effects on the environment may be virtually irreversible.

A third concern we have for the future relates to the funding necessary to bring invasive, nonindigenous aquatic plants under maintenance control, including the funding for the necessary related research that must be done. For many reasons, our costs are escalating dramatically. For example, every year funding for management activities remains low, new infestations occur and existing infestations expand, dramatically increasing the costs of achieving or restoring maintenance control. Also, in the past ten years there has been a 70% increase in herbicide and mechanical harvester costs. Add to this the loss of federal funds and you have the makings of a real environmental catastrophe.

We have estimated that the funding needed for hydrilla alone for this fiscal year to be about \$13 million. [But the Bureau received only about *a tenth* of that...*Ed.*] At present, water hyacinth and water lettuce are under maintenance control, and hydrilla is under maintenance control in about 30 of our large public water bodies. We estimate that the total acres of hydrilla remaining in public waters to be about 45,000 acres--down from about 100,000 acres of two years ago. This is impressive progress which soon could be lost.

At the same time that invasive aquatic plant problems are being under funded, both the public and political leaders are focused on water quality issues. The irony is that we may spend millions, if not hundreds of millions as in the case of the Everglades, to improve water quality, only to find that the beneficiaries of that improvement are the invasive exotics that are destroying our biodiversity and negatively impacting the economy of the state by millions of dollars annually.

These three concerns constitute what I believe is a formula for the creation of an environmental disaster: an uninformed and uncaring public; a cavalier attitude regarding the introduction of invasive exotic plant species; and an unwillingness on the part of government to commit the funds necessary to avert this tragedy.

Odds 'n' Ends

The Minnesota Department of Natural Resources has completed a **four-year study on the potential to selectively control Eurasian water milfoil** (*Myriophyllum spicatum*) with fluridone herbicide (trade name Sonar). For a copy of the final report, contact Ms. Wendy Crowell, MN DNR - Exotic Species Program, Ecological Services Section, 500 Lafayette Rd, St. Paul, MN 55155-4025, (612)-282-2508. E-mail: wendy.crowell@dnr.state.mn.us

The goal of the **Hawaiian Ecosystems at Risk (HEAR)** project is to provide resources (technology, methods, and information) to resource managers statewide to aid in the fight against invasive alien species statewide. It is based at the Botany Department of the University of Hawaii. For information about HEAR, visit: <http://www.hear.org/>

Clean Lakes homepage. <http://www.epa.gov/OWOW/lakes/lakes.html>



Odds 'n' Ends -- Continued

Biological control. A case study, *Use of Aquatic Weevils to Control a Nuisance Weed in Lake Bomoseen, Vermont*, EPA document number 841-F-97-002, Number 3, can be downloaded from <http://www.epa.gov/OWOW/lakes/onlndocs.html>. Free printed copies of this and other reports are available from National Center for Environmental Publications and Information (NCEPI), 11029 Kenwood Road, Building 5, Cincinnati, OH 45242; (513)-489-8190; (800)-490-9198. Other case studies can be downloaded from the same site.

Index of Watershed Indicators. Aquatic resources information on all 2,111 watersheds in the continental United States. 15 different indicators, or data layers, which describe the watershed's health: <http://www.epa.gov/surfiwi/>

St. Johns RiverPage. A Web "digest of environmental issues, organizations, and events", from the St. Johns River watershed in northeast, north-central and east-central Florida: <http://www.stjohnsriver.org/default.shtml>

Native plants of South Florida. An interesting amateur Web site: http://www.mangonet.com/~doog/sofl_plants/index.html

Pulling Together—National Strategy for Invasive Plant Management, is the magnum opus of the Federal Interagency Committee for the Management of Noxious and Exotic Weeds. This book is "a strategic overview...a road map intended to highlight successful ways to battle invasive plants." Read the entire book online, or download it: <http://bluegoose.arw.r9.fws.gov/ficmnewfiles/NatlweedStrategytoc.html>

Biological Control of Weeds Working Group Web site: <http://gmv.ifas.ufl.edu/~iobcweed/>

The **Tianjin Aquatic Research Institute** is engaged in studies of the ecology, physiology and reproduction of freshwater fish, and maintains large-scale fish culture facilities. E-mail: look@shell.tjvan.com.cn

The **International Society of Limnology (SIL)** seeks funds to help develop limnology-education materials for undergraduate students in developing countries, especially in the areas of general limnology, methods and identification keys. Contact Prof. Bob Wetzel, E-mail: RWETZEL@biology.as.ua.edu

To report finding purple loosestrife in Vermont, or to get an informative purple loosestrife flyer, contact Department of Environmental Conservation, Water Quality Division, Wetlands Office, 103 South Main Street, Bldg. 10 North, Waterbury, Vermont 05671-0408, (802)-241-3770.

The **USDA-ARC Aquatic Weed Control Laboratory** is associated with the University of California at Davis. For information about its research and other programs, visit its WWW site: <http://veghome.ucdavis.edu/AquaticWeed/AQUATIC.HTM>

The **Wetland Science Institute (WLI)** is part of the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture. The purpose of the WLI is to provide expertise to NRCS and others regarding wetland delineation, conservation and creation and to serve as technical liaison with government and university research centers. For more information, contact Billy M. Teels, Director, Wetland Science Institute, 11400 American Holly Drive, Laurel, MD 20708-4014, (301)-497-5938. WWW: <http://www.pwrc.nbs.gov/wetsci.htm>

Prentox Prenfish Grass Carp Management Bait is a product specifically developed to selectively kill grass carp. It is a rotenone based product which according to the manufacturer can remove grass carp "without harm to desirable game fish." For more information, contact Prentiss Incorporated (516)-326-1919; or contact product developer, Dr James R. Fajt, (913)-539-9194 or E-mail: Jimfajt@aol.com

Natives vs Exotics. "There is absolutely no biological validity to the concepts of 'native' and 'exotic' species..." For a different and thought-provoking point of view regarding non-native species, direct your browser to: http://www.s-p-h.com/grower/natives_vs_exotics.html

Keeping submersed plants under control around boat and fishing docks can be done automatically by the **Crary WeedRoller**, a patented machine that repeatedly rolls a heavy aluminum tube in an arc around a drive unit that is attached to a dock piling. By "agitating the lake bottom" in this way, plants are prevented from growing, leaving bare bottom. For more information, contact Crary Company, Box 849, West Fargo, ND 58078-0849, (800)-247-7335. The base price for the 25-foot unit for a depth of 5 feet is \$2,395.

Among the plethora of purple loosestrife interest groups is the **Manitoba (Canada) Purple Loosestrife Project**. Their Web site includes newsletters, brochures and pictures as well as research notes and abstracts: <http://www.ducks.ca/purple/>

Books/Reports

MARKETING AND SHIPPING LIVE AQUATIC PRODUCTS--Proceedings from 1996 Conference, October, 1996, Seattle, Washington, edited by B. Paust and J.B. Peters. 1997. 288 pp.

(Order from Northeast Regional Agricultural Engineering Service, Cooperative Extension, 152 Riley-Robb Hall, Ithaca, NY 14853-5701. US\$65 plus US\$7 S/H. 607-254-8770, E-mail:nraes@cornell.edu)

This is a collection of forty-nine papers that discuss animal welfare, environmental issues, shellfish, finfish, ornamentals, holding and transport, and marketing and regulatory issues. Some of the issues discussed also relate to the aquatic plant nursery industry, although not one of the papers here are about aquatic plants, per se.

NOTES ON FLORIDA'S ENDANGERED AND THREATENED PLANTS by N.C. Coile. 1996. 88 pp.

(Order from Florida Department of Agriculture and Consumer Services, Division of Plant Industry, POB 147100, Gainesville, FL 32614-7100. Contribution No. 38.)

Florida's "Regulated Plant Index" contains 339 endangered species, 66 threatened species and eight commercially exploited species. This book contains descriptions of all these rare species, as well as their scientific and common names, families, and references, as well as county locations in Florida. However, there are no illustrations of any sort.

AQUATIC PLANT MANAGEMENT IN LAKES AND RESERVOIRS, edited by M.V. Hoyer and D.E. Canfield. 1997. 103 pp.

(Order from North American Lake Management Society, POB 5443, Madison, WI 53705-5443. \$20 members, \$15 non-members.)

This trustworthy manual, meant for informed citizens and management/regulatory professionals, summarizes the "whys and

wherefores" of aquatic plant management, and presents practical information for designing and implementing aquatic plant management programs. Presented in a refreshingly austere format (the editors are more interested in subject matter than in typography), chapters cover the history and development of aquatic weed control, aquatic plant biology, management problems, management techniques, and developing management plans.

GUIDE TO AQUACULTURE CALCULATIONS AND CONVERSIONS, by A.M. Lazur. 1997. 44 pp.

(Order from IFAS Publications, POB 110011, Gainesville, FL 32611-0011, 1-800-226-1764. \$7 plus \$3 S/H and applicable tax.)

This is a reference for the formulas necessary to operate an aquaculture facility: estimating volumes for tanks and ponds of various shapes; calculating feed conversion; estimating fish weight; calculating chemical treatments; converting temperatures; figuring pumping rates... Also included are a dozen equivalency and conversion tables.

BRAZILIAN PEPPER MANAGEMENT PLAN FOR FLORIDA--A REPORT FROM THE FLORIDA EXOTIC PEST PLANT COUNCIL'S BRAZILIAN PEPPER TASK FORCE,

edited by Amy Ferriter. 1997. 31 pp.

(This report may be downloaded in Adobe Acrobat format from

<http://aquat1.ifas.ufl.edu/brazi pep.pdf>)

The Brazilian pepper tree (*Schinus terebinthifolius*) is one of the worst weeds of south Florida--millions of the exotic trees grow along hundreds of miles of canals and highways and in innumerable backyards. This report is the product of a task force of experts who reviewed the situation in Florida and listed eight "priority recommendations." Included are descriptions of its taxonomy, morphology, reproduction, toxicity, economic uses, distribution, ecology and economic impact. Other sections discuss management options, including mechanical

control, control by fire, herbicidal control, and seven case studies from south Florida.

HANDBOOK 2. BILHARZIA PREVENTION AND HYDRO-ELECTRIC RESERVOIRS. HANDBOOK 3. CONTROL OF AQUATIC SNAILS. HANDBOOK 4. MALARIA PREVENTION IN THE PLANNING OF IRRIGATION SYSTEMS, by Blue Nile Associates. 1995. Various pages.

(Order from Blue Nile Associates, POB 552, Dolores, CO 81323. 970-882-7778.

E-mail: bluenile@mcimail.com Handbook 2: \$25. Handbook 3: \$50. Handbook 4: \$30.)

More than 200 million people are infected with bilharzia worms (schistosomiasis). This human disease is spread by aquatic snails living in rivers, canals, ditches and other water bodies. The number of snails is linked to the amount of aquatic plants present; plants serve as the snails' food and sites for egg deposition. Blue Nile Associates are consultants on tropical diseases in water resource development projects. Written especially for parasitologists and engineers, these handbooks contain guidelines for designing tropical dams and irrigation systems to avoid health problems. They also contain detailed 1995 cost information on disease control measures, useful in planning and teaching.

PFLANZENGESELLSCHAFTEN NORDOSTDEUTSCHLANDS -- PLANT COMMUNITIES OF NORTHEAST GERMANY, I. Aquatic and Terrestrial Plants, by

H. Passarge. 1996. 298 pp.

(Order from Gebr. Borntraeger Verlagsbuchhandlung, Johannesstr. 3 A, D-70176 Stuttgart, Germany. DM48.00.)

This book, in German, is about the phytosociology of the rivers, lakes and wetlands of northeastern Germany. More than 50 plant associations are described, 24 of them aquatic. Numerous tables describe plant habitats and water chemistry.

AQUARIENPFLANZEN, by C. Kassermann. 1995. 472 pp.

(Order from Verlag Eugen Ulmer, Stuttgart.)

This book is for aquarium plant lovers, who read German. The book treats more than 300 aquatic and wetland plants; each treatment includes a high quality color photograph (mostly very good field shots), taxonomy, distribution, plant description, culturing requirements and ecology. According to C.D.K. Cook, "the book is a thoroughly professional work and deserves a wider readership than just German-speaking aquarium freaks."

THE RIVER SCENE--Ecology and cultural heritage, by S.M. Haslam, with contributions from J. Purseglove and G.A. Wait. 1997. 344 pp.

(Order from Cambridge University Press, The Edinburgh Building, Cambridge CB2 2RU, United Kingdom; 40 West 20th Street, New York, NY 10011-4211; 10 Stamford Road, Oakleigh, Victoria 3166, Australia.)

Sylvia Haslam loves rivers: "Rivers are much too unprotected and vulnerable. The loss of water and the loss of wildlife and cultural heritage, have become unacceptable... River integrity has no one to speak for it." In this, her latest book about rivers, she seeks to help non-specialists understand rivers by presenting some "shoulds" of rivers in their natural environment ("rivers should have much diversity", etc.) and of rivers in relation to their cultural heritage (rivers should not look like industrial refuse zones). The copiously illustrated book "aims to give a wide view and an overview", looking at rivers in terms of water, structure, vegetation, pollution, birds, cultural heritage and controlled recreation, omitting information about invertebrates, fish, chemistry, diatoms, other algae and micro-organisms. Though the book concentrates on British rivers, the lessons and "shoulds" apply to rivers worldwide.

BIOLOGICAL POLLUTION -- The Control and Impact of Invasive Exotic Species, edited by Bill N. McKnight. 1993. 261 pp.

(Order from Purdue University Press, 1532 South Campus Courts Bldg E, West Lafayette, IN 47907-1532. 317-494-2038; 1-800-933-9637. \$30 plus S/H.)

"Biological pollution is one of the least publicized environmental issues facing us," says the editor. This is the proceedings of a symposium held at Indiana University-Purdue University at Indianapolis, October 25-26, 1991. It includes 21 reviews and case studies covering invasive species as diverse as fungi, fish, fire ants, domestic cats, and aquatic plants. "What role can science play in eliminating or slowing this alien invasion?"

NON-TARGET IMPACTS OF THE HERBICIDE GLYPHOSATE, by D.S. Sullivan and T.P. Sullivan. 1997. 302 pp.

(Order from Applied Mammal Research Institute, 11010 Mitchell Avenue, R.R. #3, Summerland, B.C., Canada.)

Glyphosate is a herbicide that is used in agriculture, forestry and aquatic ecosystems. This book is a compendium of references and abstracts extracted from the major on-line literature databases. Included are several thousand items covering environmental impacts, toxicology, efficacy and human health. Ten sections include aquatic invertebrates and algae, biodiversity-conservation and habitat restoration/alteration, birds, fish, human health, mammals, microflora and fungi, plant and soil residues, terrestrial invertebrates and water quality.

STRATEGIES FOR WATER HYACINTH CONTROL--Report of a Panel of Experts Meeting 11-14 September, 1995, Fort Lauderdale, Florida, USA, Food and Agricultural Organization of the United Nations. 1996. 217 pp.

(Order from R. Labrada, Food and Agricultural Organization of the United Nations, Rome, Italy.)

"Water hyacinth (*Eichhornia crassipes*) is still the major floating water weed in the world despite nearly 100 years of attempts to control it." This book of 16 articles by international experts focuses on water hyacinth problems in developing countries, and ef-

forts to manage them, with special emphasis on insect biological control methods. A recommendations section presents guidelines for hyacinth control in developing countries, and strategies for implementing them.

BIOLOGICAL CONTROL OF WEEDS--Proceedings of the VIII International Symposium on Biological Control of Weeds, 2-7 February, Canterbury, New Zealand, edited by E.S. Delfosse and R.R. Scott. 1996. 760 pp.

(Order from CSIRO Publishing, POB 1139, Collingwood 3066, Victoria, Australia. (+61)-3-9662-7666. E-mail: sales@publish.csiro.au)

As the most comprehensive collection of its kind, this book of 135 papers covers all aspects of the theory and current practice of biological control of weeds. Topics include biological control in protected natural areas, aquatic habitats, forests, pasture rangelands and crops; selecting agents and targets; economics and evaluating impacts; and screening, rearing, releasing and managing agents, particularly plant pathogens and arthropods.

STEMMING THE TIDE--Controlling Introductions of Nonindigenous Species by Ships' Ballast Water, by the Committee on Ships' Ballast Operations, National Research Council. 1996. 160 pp.

(Order from National Academy Press, 2101 Constitution Avenue, NW, Lockbox 285, Washington, DC 20055. 1-800-624-6242. WWW: <http://www.nap.edu> US\$39.95 hard-bound.)

Ballast is any solid or liquid that is taken aboard ship to achieve more controlled and safer operation. It has been estimated that more than 3,000 species of animals and plants are transported daily around the world in ballast water, including species such as zebra mussels, comb jellyfish, seagrasses, and possibly freshwater plants. When these species are released in new areas, well-known ecological problems can result. This

book assesses current approaches to the problem and makes recommendations for U.S. government agencies and the international maritime industry.

STRANGERS IN PARADISE--Impact and Management of Nonindigenous Species in Florida

edited by D. Simberloff, D.C. Schmitz and T.C. Brown. 1997. 467 pp.

(Order from Island Press, Box 7, Dept. 2PR, Covelo, CA 95428. 800-828-1302. US\$29.95.)

In Florida, millions of acres of land and water have been invaded by non-native plants and animals. Does this mean that introduction of all non-native species should be regulated? Including plants that nobody thinks will ever spread and become invasive? "Well,...yes!" the editors of this book say. It "provides the first comprehensive in-depth examination of the Florida experience." Chapters include "case studies" of nonindigenous insects, invertebrates, fishes, amphibians and reptiles, birds and mammals; examples of various "management strategies"; policy and implementation discussions; and essays on the roles of federal and state governments.

MANAGEMENT AND ECOLOGY OF FRESHWATER PLANTS; Proceedings of the 9th International Symposium on Aquatic Weeds, European Weed Research Society

edited by J.M. Caffrey, P.R.F. Barrett, K.J. Murphy and P.M. Wade. 1997. 376 pp.

(Order from Kluwer Academic Publisher, Order Dept., POB 322, 3300 AH Dordrecht, The Netherlands. US\$224.00. E-mail: services@wkap.nl)

This proceedings provides "a valuable insight into the complexities involved in managing aquatic systems, discusses state-of-the-art control techniques such as biomanipulation using fish and waterfowl and the use of straw, and deals with patterns of regrowth and recovery post-management." The symposium held in Dublin in 1994 drew 270 delegates from 35 countries. Fifty-six papers are included in

the following sections: Ecology of Freshwater Plants; Plant-Environment Interactions; Aquatic Weed Problems; Control of Freshwater and Riparian Vegetation; and Utilization of Freshwater and Riparian Vegetation.

Proceedings of the IX INTERNATIONAL SYMPOSIUM ON BIOLOGICAL CONTROL OF WEEDS

edited by V.C. Moran and J.H. Hoffmann. 1996. 563 pp.

(Order from J.H. Hoffmann, Zoology Department, University of Cape Town, Rondebosch 7700, South Africa. US\$75, surface; US\$95, air. E-mail: hoff@botzoo.uct.ac.za)

Nearly 170 refereed papers and abstracts are included in this Proceedings of the meeting that took place in Stellenbosch, South Africa, January 19-26, 1996. Many of them are about aquatic plants. Sections include: Ecology of Invasive Plants; Host Range, Specificity, and Recruitment; Pre-Release Studies; New Developments, Strategies and Overviews; Agent Performance; Integrated Control and Management; Evaluation and Economics; and the International Bioherbicide Workshop. Each section is treated with a "synthesis" by an expert in the field.

MANAGING AQUATIC VEGETATION WITH GRASS CARP--A Guide for Water Resource Managers

edited by John R. Cassani. 1996. 196 pp.

(Order from American Fisheries Society, Publication Fulfillment, POB 1020, Sewickley, PA 15143. US\$18.00 plus S/H. (412) 741-5700. Fax: (412) 741-0609.)

Development of the triploid grass carp (*Ctenopharyngodon idella*) has increased the use of this weed-eating fish. This manual is the result of the American Fisheries Society "identifying the need for a comprehensive source of information on managing aquatic vegetation with grass carp." It includes sections on the use of grass carp in managing aquatic weeds in lakes, ponds, impoundments, rivers and canal systems. Recapture and removal techniques are covered, and a review of Florida's experiences in administering the grass carp program is

presented. Stocking rates, ecological side-effects, diseases and parasites, staff requirements and other management issues are covered.

THE VASCULAR PLANTS OF THE NORTHEASTERN PART OF THE HUNGARIAN GREAT PLAIN--Az Eszak-Alfold Edenyek Floraja

edited by Istvan Fintha. 1994. 359 pp.

(Order from the bookstore: AQUA, Kiado es Nyomda Leanyvallalat, H-1075, Budapest, Kazinczy u. 3/b. Hungary.)

This book, in Hungarian, surveys the flora of the Alfold, or Great Hungarian Plain (2,800 sq. km.). More than 1,000 species are listed, including many new plants for Hungary, as well as 200 alien and garden plants.

LAS TABLAS DE DAIMIEL--Ecologia Acuatica y Sociedad

edited by M. Alvarez Cobelas and S. Cirujano. 1996. 371 pp. (In Spanish.) (Order from Direccion General de Conservacion de la Naturaleza, Organismo Autonomo Parques Nacionlaes, Servicio de Publicaciones, Gran Via de San Francisco 4, 28005 Madrid, SPAIN. US\$21.00 plus S/H. Fax: (91)3476303.)

Las Tablas de Daimiel is a 1700 hectare wetland found on the La Mancha plain of south-central Spain. "It is experiencing very high organic pollution coming from the towns in its watershed." Macrophyte vegetation species richness has decreased from 25 species reported in 1974 to 15 species reported in 1995; fish species have declined from 13 species twenty years ago to 2 species today. Although humans have lived at Las Tablas for the past 3,600 years, data shows that in only 20 years man has overexploited Las Tablas and in doing so, reduced its area by two thirds. The Spanish government is determined to restore and conserve Las Tablas. This book compiles what is known about the area's morphology and climate, water chemistry and production, as well as man's impacts on these unique wetlands.

FLORIDA AQUACULTURE PLAN, Current Status, Opportunities and Future Needs,

by Anonymous of the Bureau of Seafood and Aquaculture, Florida Department of Agriculture and Consumer Services. 1996. 72 pp.

(Order from Division of Marketing and Development, Bureau of Seafood and Aquaculture, 2051 E Dirac Drive, Tallahassee, FL 32310.)

This book contains general information about the aquaculture industry in Florida, with descriptions of ten aquaculture products, possible future products, and a listing of "research priorities" received from various state sources. (According to this report, the aquatic plant industry in Florida in 1995 generated \$8.6 million in sales, compared to \$52.5 million for tropical fish and \$4.5 million for alligators.) Appendixes include the Florida Statutes relative to aquaculture as of 1996.

PEATLANDS IN FINLAND,

edited by Harri Vasander. 1996. 168 pp. (In English.)

(Order from the Finnish Peatland Society, Kuokkalantie 4, FIN-40420, Jyska, Finland. About US\$40.)

Finland's 10 million hectares of peatlands are "a major and fascinating element of the Finnish landscape and national economy." Since the Stone Age, peat, which is made of fragmented plant residues, has been used for the production of energy. As peat has been cut-away and burned, peatlands have been converted to agriculture and forestry. This handsome and colorful book, an "updated interdisciplinary review", is filled with pictures, illustrations and maps, and includes sections on the ecology and natural history of Finnish peatlands, Finland's peat resources, economic utilization of peatlands, environmental aspects of peatland utilization, and options for managing harvested peatlands.

MIRES OF JAPAN--Ecosystems and Monitoring of Miyatoko, Akaiyachi and Kushior Mires,

edited by Toshio Iwakuma. 1996. 127 pp. (In English.)

(Order from the National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba 305, Japan.)

Mires are peatlands. This report intends to give perspective on Japanese peatlands, and the modern methods that the Japanese have developed to monitor peatlands. Maps, weather information, hydrology, water chemistry, and soils are presented, Plant species occurrence, phenology, and community composition are described. Remote sensing techniques are also described.

GROW YOUR OWN NATIVE LANDSCAPE: A Guide To Identifying, Propagating, and Landscaping with Western Washington Native Plants,

edited by Michael Leigh. 1996. 132 pp.

(Order from WSU Cooperative Extension, Thurston County, Native Plant Salvage Project, 6128 Capitol Blvd. S.E., Suite 3, Olympia, WA 98501; (360) 786-5445.)

This booklet is an introduction to native plants, explains what native plants are and lists the benefits of using them for landscaping. It lists native plants according to their need for sunlight and moisture; it explains how to buy and collect plants, and includes detailed instructions for propagating and salvaging native plants. Descriptions of more than 90 native plants suitable for growing in Washington state are included. It may be the best basic handbook on collecting and growing native plants that the **APIRS** library has.

AQUATIC AND WETLAND PLANTS OF KENTUCKY,

by Ernest O. Beal and John W. Thieret, with illustrations by Sara Fish Brown. 1986. 1996. 312 pp.

(Order from Kentucky State Nature Preserves Commission, 801 Schenkel Lane, Frankfort, KY 40601; (502) 573-2886. \$22 plus \$2.68 S/H.)

This is a reprint of the 1986 identification manual. It includes identification keys, descriptions, illustrations, county distribution maps and notes on habitat, overall range and biology of hundreds of plants that grow in water or in soil saturated, at least much of the year, with water.

RESTORING PRAIRIE WETLANDS--An Ecological Approach,

by Susan M. Galatowitsch and Arnold G. Van der Valk. 1994. 246 pp.

(Order from Iowa State University Press, 2121 S. State Avenue, Ames, Iowa 50014-8300; 1-800-862-6657. \$44.95 plus S/H.)

This book "describes and assesses ecological-based methods of restoration in the southern prairie pothole region--Iowa, Minnesota, and South Dakota." The main problem discussed by this book is whether or not "restored" wetlands function as the original wetlands did, and what difference it makes if they do not. The book examines ecological and technical considerations in planning, constructing, managing and evaluating wetland restorations. It includes plant, animal and soils lists of the pothole region.

BIOLOGIC AND ECONOMIC ASSESSMENT OF BENEFITS FROM USE OF PHENOXY HERBICIDES IN THE UNITED STATES, edited by Orvin C. Burnside. 1996. 227 pp.

(Ordering information unknown. However, the entire book can be accessed via WWW: <http://piked2.agn.uiuc.edu/piap/phenoxy.html> The section on use of 2,4-D in aquatic systems, written by Dr. Carole Lembi can be found at <http://piked2.agn.uiuc.edu/piap/assess2/ch12.htm>

This report was prepared by a dozen of the world's authorities on phenoxy herbicides, such as 2,4-D. The work was sponsored by the National Agricultural Pesticide Impact Assessment Program (NAPIAP), a USDA and state cooperative program. It includes chapters on the history of 2,4-D, risk assessment, potential effects of banning phenoxy herbicides, and the use of phenoxy herbicides in agriculture, forestry and aquatic systems. The book also includes "An Overview of the Epidemiology and Toxicology Data", which is a thorough review of 74 scientific papers and case-studies of the effects of phenoxy herbicides on animals and humans. This Overview is at <http://piked2.agn.uiuc.edu/piap/assess2/ch3.htm>

FROM THE DATABASE

Here is a sampling of the research articles, books and reports which have been entered into the aquatic plant database since January 1997.

The database has more than 44,000 citations. To receive free bibliographies on specific plants and/or subjects, contact APIRS or use the database online at <http://aquat1.ifas.ufl.edu/>

To obtain articles, contact your nearest state or university library.

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The Electronic Media Page

Digital Floristic Synthesis of North America

Diskettes for Windows 95 or 3.1, produced by the Biota of North America Program, University of North Carolina

Thirty-six thousand (36,000) species are included in this monumental new computer version of the standard plant reference for U.S. federal agencies: the *Synonymized Checklist of the Vascular Flora of the United States, Canada and Greenland* by Dr. John T. Kartesz. The computer version, however, contains *much* more information than the printed version.

This PC/Windows computer program provides plant nomenclature, taxonomy, geography, morphology and other information distilled from nearly 300 years of North American vascular plant systematic research. Linking nearly 500,000 records of plant distributions, this software enables taxonomists, horticulturalists, nurserymen, foresters, plant and wildlife managers, ecologists and others to produce species checklists and distribution summaries, and assessments of species morphology, species rarity, species endemism, species nativity, etc.

Plants can be selected by scientific and common names or by choosing any of 45 biological attributes. The user-friendly system permits complicated Boolean operations to be performed with the click of a mouse, and displays the results graphically as distribution maps.

Four individual products are available: three stand-alone programs, and a fourth product that combines the other three.

Product #1 Lexicon \$99.00 plus S/H

The Lexicon enables users to show immediate relationships between taxa at various ranks and to produce listings of all plant names in current use. This product uses the International Code of Botanical Nomenclature for spelling and orthography.

Product #2 Floristic Atlas \$295.00 plus S/H

The Atlas displays state level distribution maps for the 36,000 species, allowing the maps to be printed in publication-quality format, black and white or color. Zoom capabilities will permit county-level and even site-specific data to be added to future editions of the Atlas. A county data update is planned for release in the summer of 1998.

Product #3 Biological Attributes \$195.00 plus S/H

This product includes up to 45 biological attributes for each of the 36,000 species, including morphology and other specialized data such as rarity, weediness, insectivory, habit, habitat, trophic levels, duration, medicinal value, forage and range values, toxicity.

Product #4 Taxonomic Toolbox \$495.00 plus S/H

This product combines the previous three products into a unified system and costs less than if purchased individually.

Order from Patricia Ledlie Bookseller, Inc., Conservation Biology Books, One Bean Road, POB 90, Buckfield, Maine 04220, (207) 336-2778. E-mail: ledlie@maine.com

Questionnaire Results

Looking for someone who speaks Spanish and studies *Azolla*? Or a field research contact in New Zealand? The last issue of **AQUAPHYTE** contained a questionnaire for personnel in aquatic plant research and management with the purpose of compiling a searchable database of this group. The project was performed in conjunction with the Aquatic Plant Management Society, Inc. (APMS). Over 1,200 people responded to the questionnaire and the database is now available for searching. Any field from the questionnaire can be searched, including name, address, languages spoken, fields of expertise (subjects, plants, countries), employer, etc. The database contains other essential information such as telephone and fax numbers, E-mail addresses and WWW/Internet sites. For searches of the Database of Personnel in Aquatic Plant Research and Management, contact **APIRS** or Dr. Alison Fox, APMS President, University of Florida, Agronomy Department, POB 110500, Gainesville, FL 32611 USA, 352/392-1808, E-mail: amfox@gnv.ifas.ufl.edu

All respondents to the questionnaire were entered into a drawing at the annual APMS meeting for a complete set of the *Journal of Aquatic Plant Management* (1962-1996). The winner was Dr. Michael Braverman, Department of Plant Pathology and Crop Physiology, Louisiana State University, Baton Rouge, Louisiana. (*According to the database, he speaks Thai.*)

The last issue of **AQUAPHYTE** (VOL. 16 NO. 1) also required a subscription renewal for continued receipt of this free newsletter. Over 1,200 aquatic and wetland plant managers, researchers, students and others renewed their subscription to our publication. Please remember that **AQUAPHYTE** is a unique forum for this specialized group of researchers and managers. We encourage the submission of news and articles of interest to our readers.

More Aquatic and Wetland Plants in Pen-and-Ink

Additional line drawings of aquatic and wetland plants have been added to the **APIRS** collection and, when purchased, may be used in any and all publications without need for further copyright permissions. All were drawn by artist Ann Murray.

The original package of 115 aquatic plant drawings is being sold as *Aquatic Plants in Pen-and-Ink* (IFAS Pub. No. SP233). Refer to the Winter 1996 issue of **AQUAPHYTE** (or visit our Web site) for a complete listing of the 115 plants. It costs \$35 plus S/H.

The additional 25 drawings are known as *Aquatic Plants in Pen-and-Ink, 1997 Supplement* (IFAS Pub. No. SP243). The Supplement costs \$10 plus S/H.

Orders for either must be placed with IFAS Publications, University of Florida, POB 110011, Gainesville, FL 32611-0011, 1-800-226-1764.

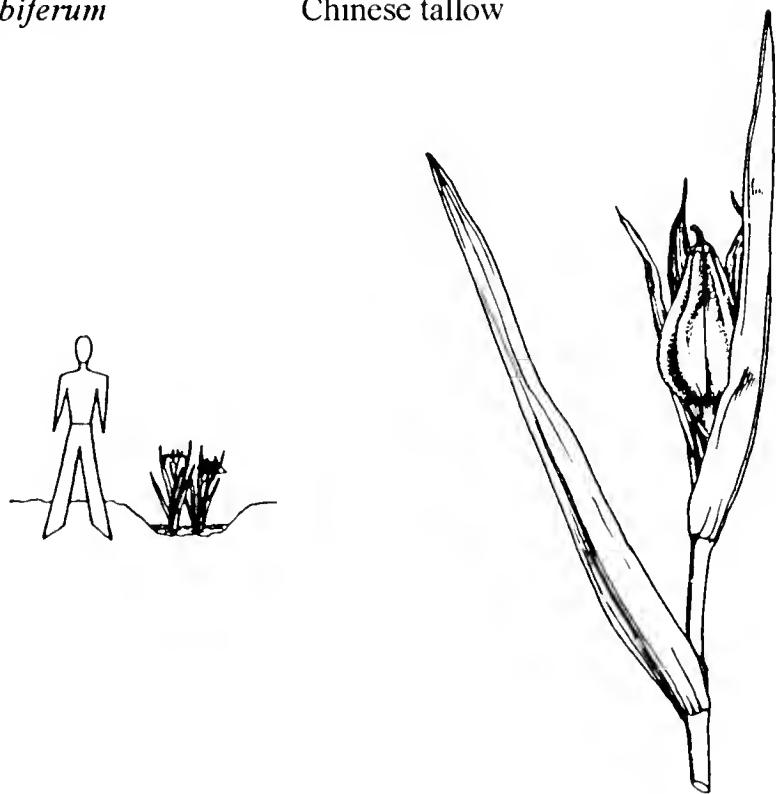
The new 8 1/2" X 11" drawings in the **1997 Supplement** (IFAS Pub No. SP243) include:

- | | |
|----------------------------------|----------------------------|
| <i>Aletris farinosa</i> | colic-root |
| <i>Allium canadense</i> | Canada garlic |
| <i>Asclepias lanceolata</i> | milkweed |
| <i>Asimina reticulata</i> | pawpaw |
| <i>Cyperus alopecuroides</i> | |
| <i>Cyperus difformis</i> | smallflower umbrella sedge |
| <i>Cyperus iria</i> | rice flatsedge |
| <i>Cyperus prolifer</i> | dwarf papyrus |
| <i>Echinodorus cordifolius</i> | creeping burhead |
| <i>Eleocharis equisetoides</i> | spikerush |
| <i>Equisetum hyemale</i> | scouring rush horsetail |
| <i>Eriocaulon decangulare</i> | pipewort |
| <i>Fuirena scirpoidea</i> | rush fuirena |
| <i>Iris virginica</i> | southern blue flag |
| <i>Juncus megacephalus</i> | bog rush |
| <i>Lygodium microphyllum</i> | Old World climbing fern |
| <i>Mayaca fluviatilis</i> | bog moss |
| <i>Micranthemum glomeratum</i> | baby's-tears |
| <i>Nymphoides aquatica</i> | banana lily |
| <i>Potamogeton diversifolius</i> | variable-leaved pondweed |
| <i>Potamogeton pusillus</i> | pondweed |
| <i>Proserpinaca palustris</i> | mermaid weed |
| <i>Proserpinaca pectinata</i> | mermaid weed |
| <i>Sambucus canadensis</i> | elderberry |
| <i>Sapium sebiferum</i> | Chinese tallow |



Iris virginica
Southern blue flag

ARM



Be There, Do That

IAGLR 98: Special Session on the African Great Lakes.

May 18-22, 1998. Hamilton, Ontario, Canada.

"This is an especially good time to review what we are learning, appreciate results coming from diverse African lake systems and to compare the new understanding about African Great Lakes with current and past research on North American Great Lakes...we are prepared to arrange special focus meetings outside the session if you would like to lead or participate in discussions about current or future research opportunities on the African Lakes."

Visit WWW: <http://www.geog.buffalo.edu/iaglr> or contact S.J. Guildford at sjg@golden.net

WATERSHED MANAGEMENT: MOVING FROM THEORY TO IMPLEMENTATION.

May 3-6, 1998. Denver, Colorado.

The Water Environment Federation (WEF) is sponsoring a specialty conference on watershed management, building on the 1996 conference that WEF sponsored together with the US EPA and 13 other federal agencies. Topics include implementing watershed planning, protection, restoration and education.

Contact: Water Environment Federation, 601 Wythe Street, Alexandria, VA 22314, (703)-684-2400.

25TH ANNUAL CONFERENCE ON ECOSYSTEMS RESTORATION AND CREATION.

May 14-15, 1998. Tampa, Florida.

Topics for this annual meeting include freshwater and marine wetland systems; upland systems, marsh, mangrove and seagrass restoration; upland and mixed ecosystem restoration; mitigation, permitting and regulatory policies; mine reclamation and management techniques.

Contact: Frederick J. Webb, Hillsborough Community College, 1206 N. Park Road, Plant City, FL 33566, (813) 757-2104. E-mail: webb@mail.hcc.cc.fl.us

SHALLOW LAKES 98. INTERNATIONAL CONFERENCE ON TROPHIC INTERACTIONS IN SHALLOW FRESHWATER AND BRACKISH LAKES.

August 3-8, 1998. Berlin, Germany.

According to **APIRS** users, this meeting will be of interest to aquatic plant ecologists. One of the 10 themes of the conference is "Role of macrophytes in biotic and abiotic interactions".

Contact: Institute of Freshwater Ecology & Inland Fisheries Berlin, WWW: <http://www.igb-berlin.de/www/abt2/abt2.htm> Click on "Conferences".

FLORIDA WEED SCIENCE SOCIETY ANNUAL MEETING.

February 26-27, 1998. Tavares, Florida.

Contact Mr. Ken Muzyk, 813-681-3461.

10th INTERNATIONAL SYMPOSIUM ON AQUATIC WEEDS--Towards An Integrated Aquatic Plant Management.

September 22-25, 1998. Lisbon, Portugal.

A Call For Papers. This conference of the European Weed Research Society (EWRS) is being organized and hosted by the Institute of Agronomy at Lisbon. "As pieces of the ecosystems puzzle, aquatic plants and their weedy behaviours are starting to be viewed in a wider context of watershed management...the scientific program of the conference will cover all aspects of aquatic plant systematics, ecology and management and will focus on an integrated approach to the management of aquatic vegetation." The conference will include excursions. A "proceedings" will be published.

Contact: APRH Secretariat, 10th EWRS Int. Symp. On Aquatic Weeds, a/c Laboratorio Nacional de Engenharia Civil, Avenida do Brasil 101, 1799 Lisboa codex, PORTUGAL.

INTECOL VII INTERNATIONAL CONGRESS OF ECOLOGY.

July 19-25, 1998. Florence, Italy.

Organized by the International Association for Ecology (INTECOL) in conjunction with the Italian Ecological Society (SIIE), the motto of this congress is New Tasks for Ecologists after Rio 1992. It is an invitation to all ecologists to come together to examine the relationships of human activities and the environment in both scientific and social dimensions.

Contact:Almo Farina, Secretariat VII International Congress of Ecology, c/o Lunigiana Museum of Natural History, Fortezza della Brunella, 54011 AULLA, Italy; WWW: <http://www.tamnet.it/intecol.98>

Some Current Research at The Center

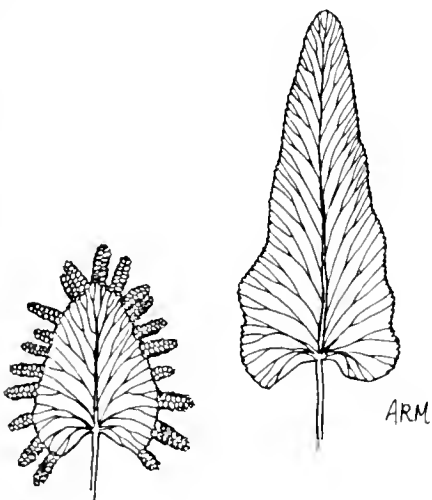
Hydrylla (*Hydrilla verticillata*) remains the worst aquatic weed in Florida, with 50,000 acres (1996) of the exotic invasive to be found in hundreds of the state's lakes, rivers and springs. As part of its legislative mandate, Center researchers conduct studies on aquatic and wetland plants and their management, especially those with known or potential economic and ecologic impacts.



Netherland and faculty advisor, Professor William Haller, apply "fungal inoculum" to research ponds filled with topped-out hydrilla.

Mr. Michael Netherland is conducting integrated control experiments on hydrilla using an endemic pathogen, *Mycocleptodiscus terrestris*, in combination with the aquatic herbicide fluridone. The inoculum is cultured in the laboratory of Dr. Judy Shearer, a co-principal investigator and biological control expert with the US Army Corps of Engineers. The studies are being carried out in ponds, a "scale-up" from earlier laboratory and mesocosm evaluations. Previous results have shown that the pathogen provides rapid "knockdown" of hydrilla, while low levels of herbicide provide residual control. Netherland is a graduate student at the Center; he's also a research biologist for the US Army Corps of Engineers in Vicksburg, Mississippi.

Old world climbing fern (*Lygodium microphyllum*) is an invasive exotic species that is shading out hundreds of acres in Florida. This climbing fern has leaves that can grow to be 100 feet long. Small sections of the underground rhizome are brought back to the laboratory facilities at Gainesville, Florida, where Center researchers are investigating the role of *Lygodium microphyllum* in Florida ecosystems.



Lygodium microphyllum - Old World climbing fern

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AQUAPHYTE

This is the newsletter of the Center for Aquatic Plants and the Aquatic and Wetland Plant Information Retrieval System (APIRS) of the University of Florida Institute of Food and Agricultural Sciences (IFAS). Support for the information system is provided by the Florida Department of Environmental Protection, the U.S. Army Corps of Engineers Waterways Experiment Station Aquatic Plant Control Research Program (APCRP), the St. Johns River Water Management District and UF/IFAS.

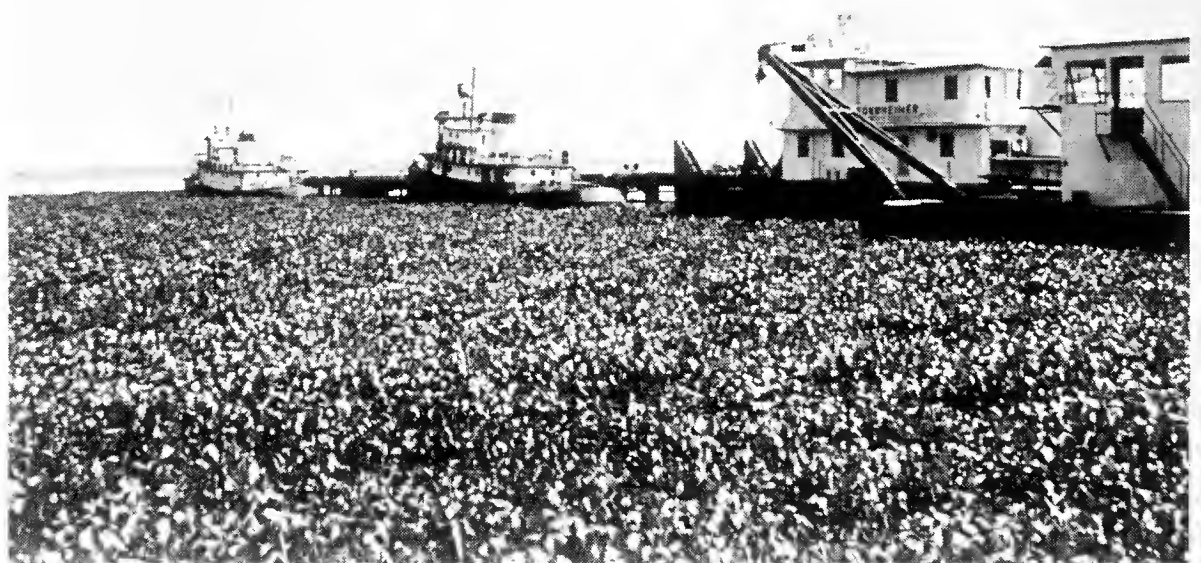
**EDITORS: Victor Ramey
 Karen Brown**

AQUAPHYTE is sent to managers, researchers and agencies in 87 countries. Comments, announcements, news items and other information relevant to aquatic plant research are solicited.

Inclusion in *AQUAPHYTE* does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.



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 BOTANICAL GARDEN**



Notable Quote:

The words "obnoxious aquatic plants" conjures up visions of waterways, rivers, streams, and their tributaries, all choked with water hyacinth, alligatorweed, hydrilla, Eurasian watermilfoil and many, many other species of undesirable aquatic plants. The vision would not be complete if we did not include the many boats and barges stuck in the vegetation and moving with vegetation as directed by the wind; or the flood waters which are being retained on land areas because floodways are choked with aquatic vegetation; or the agricultural crops suffering extensive damages because of the lengthy periods of flooding resulting from clogged drains choked with aquatics; or the untold losses to wildlife and fisheries as a result of coverage of open waters and blanketing of marshlands by obnoxious plants; or the reduced flows of life-giving water in choked irrigation ditches. We must not forget these visions because they can become reality again in short order if neglected." From *Aquatic Weed History - Century Old Problem*, by J.J. Raynes, Weeds, Trees and Turf, July 1972.